Patent Abstracts of Japan

PUBLICATION NUMBER : 2000246249
PUBLICATION DATE : 12-09-00

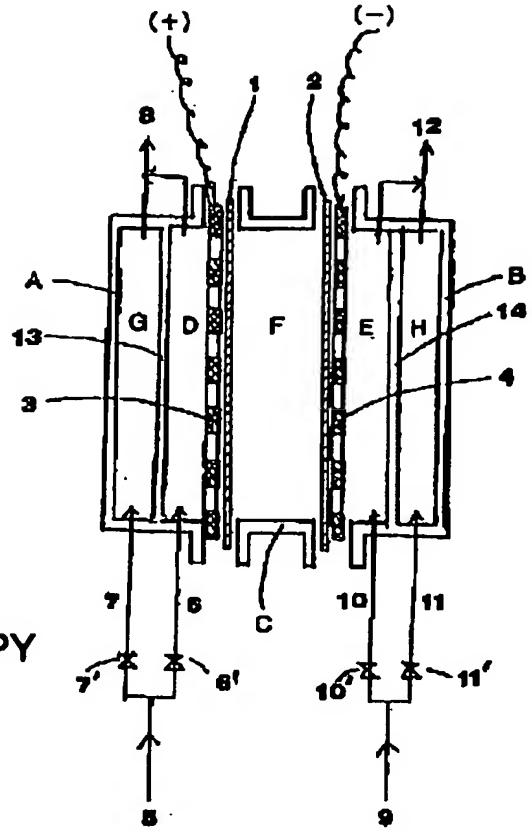
APPLICATION DATE : 01-03-99
APPLICATION NUMBER : 11052550

APPLICANT : FIRST OCEAN KK;

INVENTOR : SANO YOICHI;

INT.CL. : C02F 1/46

TITLE : PRODUCTION OF ELECTROLYTIC WATER



ABSTRACT : PROBLEM TO BE SOLVED: To save electric power, to generate free chlorine effectively, and to prevent the adhesion of scale to a cathode by adding an electrolyte into water to be electrolyzed when acidic electrolytic water of a specified pH value and alkaline electrolytic water are produced.

SOLUTION: An intermediate chamber F is filled usually with an aqueous solution containing at least about 10% of potassium chloride or sodium chloride as an electrolyte aqueous solution of a high concentration. Anions such as chloride anions in the aqueous solution migrate into an anodic chamber D by electrophoresis, while cations such as sodium cations migrate into a cathodic chamber E. In this way, acidic electrolytic water of pH 2.0-3.0 and alkaline electrolytic water of pH 10.5-12.0 are obtained. A direct current of at least 1,500 coulomb/liter water for electrolysis. In this way, electric power can be saved, the efficiency of free chlorine generation can be improved, and the adhesion of scale can be prevented.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It has the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And the raw water supplied to an anode plate side is made to shunt toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, the raw water supplied to a cathode side is made to shunt toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make a cathode room let flow the water which carries out electrolysis processing, and water is electrolyzed using the water electrolyzer which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. It is the approach of manufacturing the acid electrolysis water of pH 2.0-3.0, and the alkaline electrolysis water of pH 10.5-12.0. an electrolyte is existed in the water which carries out electrolysis processing -- making -- an anode plate and a negative plate -- electrolysis processing -- the electrolysis water manufacturing method characterized by carrying out the load of the direct current 1500C [per 1l. of service water] or more.
[Claim 2] The electrolysis water manufacturing method according to claim 1 which prepares an anode plate room, a middle room, and a cathode room, contains an electrolytic solution in a middle room, and is characterized by supplying the this contained electrolytic solution to the water which carries out electrolysis processing by electrophoresis when a cell divides with the diaphragm of two sheets.
[Claim 3] The electrolysis water manufacturing method characterized by to let flow the water which lets flow the water which carries out electrolysis processing to ** in which an electrode plate exists, and does not carry out electrolysis processing to ** in which an electrode plate does not exist using the water electrolyzer equipped with the cell which divided each ** of an anode plate room and a cathode room with the dashboard into ** in which an electrode plate exists further, and ** in which an electrode plate does not exist in the electrolysis water manufacturing method according to claim 2.
[Claim 4] By keeping and arranging spacing one by one, an anode plate, the diaphragm of two sheets, and a negative plate The water electrolyzer equipped with the cell which prepared the water flow way surrounded by the water flow way and negative plate which were surrounded with the tank wall and the anode plate by the cathode room list divided with the anode plate room and negative plate which were divided with the anode plate and the diaphragm, and the diaphragm, and the tank wall is used. And it is the electrolysis water manufacturing method according to claim 1 characterized by making each ** of the above-mentioned anode plate room and the above-mentioned cathode room let flow the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing making each above-mentioned water flow way let flow.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention electrolyzes water and relates to the approach of manufacturing acid electrolysis water and alkaline electrolysis water.
[0002]
[Description of the Prior Art] Electrolyzing the water which added the chlorine-based electrolyte of a small amount, and making acid electrolysis water and alkaline electrolysis water generate is performed conventionally. Acid conventional electrolysis water has hydrogen ion concentration (pH) in the range of 2.0-3.5 (generally 2.4-2.7), and an oxidation reduction potential (ORP) shows more than 1100V, and contains free chlorine 10 ppm or more. Thus, since acid electrolysis water contains free chlorine and presents a strong high oxidation reduction potential with acidity, it has the powerful bactericidal effect to Escherichia coli, various kinds of bacteria, or bacteria, and is beginning to be widely used in the medical field, the agricultural field, the dairy field, etc. in recent years. Moreover, the range of pH is 10.5-12.0, since alkaline electrolysis water presents strong alkalinity, having sterilizing properties too and having a strong detergency to the dirt which contains oil and protein in coincidence is known, and an application new as washing of vegetables, fruit, a zootechnics article, or a fishery article and rinse water of a machine part or an electronic ingredient is coming out of it.
[0003] In order to manufacture these acid electrolysis water and alkaline electrolysis water by the electrolysis of water The water electrolyzer of structure which divided into the anode plate room and the cathode room by the diaphragm is used. The approach of letting flow and electrolyzing into an anode plate room and a cathode room the raw water which added the electrolyte beforehand, A high concentration electrolysis room is filled up with the diaphragm of two sheets into a middle room using the water electrolyzer of structure which divided into the anode plate room, the middle room, and the cathode room, and the approach of letting flow and electrolyzing raw water into an anode plate room and a cathode room etc. is adopted.
[0004] Even if it carries out a deer, it makes it acid electrolysis water and it makes it alkaline electrolysis water, the property and presentation which are demanded greatly change with the purpose which uses it, or applications. For example, when using acid electrolysis water for medical-application ways, such as disinfection of an endoscope, the free chlorine concentration which influences the sterilization force of water is the most important, but even if the electrolytic concentration to contain is high, it is not a problem so much. On the other hand, the salinity to contain must be low when using acid electrolysis water for an agricultural application. Moreover, it will become a problem, if an odor is too strong when using it for the sterilization and gargling in opening with dentistry etc. Moreover, depending on the class of metal currently used in the case of sterilization or washing, generating of rust poses a problem. Thus, although the demand of the user to acid electrolysis water and alkaline electrolysis water was various, in order to correspond to those demands, the fundamental design specification of the electrolyzer needed to be changed former each time.
[0005] Moreover, conventional water is electrolyzed and there is a trouble of many ** in the

manufacture approach of acid electrolysis water or alkaline electrolysis water. That is, (1) electrolysis effectiveness is bad and there is much power consumption. (2) The free chlorine concentration which acid electrolysis water contains cannot become high easily, and adjustment of concentration is not easy. (3) Salt damage will be caused if it is mostly used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) It is easy to generate the trouble in which a scale adheres to cathode by electrolysis.

[0006] In the conventional manufacture approach, although some causes with much [the electrolysis effectiveness of (1) is bad and] power consumption are considered Since one is electrolyzed into water where a little electrolyte is added, the conductivity of a water solution is low, Only the ion with which electrolysis exists near an anode plate or the cathode two bypasses the water solution of most which delivers an electron in an electrode surface and is supplied to an electrolyzer, without contributing to electrolysis, and it is discharged, Some hydrogen ions which some ion electrolyzed into 3 ** passes a diaphragm, and it moves to a counter electrode side, namely, were generated in the anode plate move to cathode, and the hydroxide ion generated in cathode moves to an anode plate, When the ion concentration of an anolyte is low to four, it is that the infusion solution phenomenon of water happens from an anode plate toward cathode etc. As for the amount of theoretical currents calculated with Faraday's law required to, generate the acid electrolysis water of 2.7 as a result, for example, a pH value, it is general to require l. in 600 thru/or 1000C /in fact to being 192C/l.

[0007] Moreover, it is thought that a electrolysis reaction [in / in the above-mentioned cause of (2) / an anode plate] has low generation of the chloric-acid [degree] ion which follows generation and it of chlorine gas since the electrolytic concentration to add is low although the reaction of the chlorine ion contained in water and an electrolyte competes, and acid electrolysis underwater free chlorine concentration does not become high. Therefore, although oxides which have the catalyst effectiveness as an electrode material for anode plates, such as iridium and palladium, are used in order to raise the generating effectiveness of free chlorine as a cure conventionally, it is very expensive and it difficult to adjust free chlorine concentration freely. Moreover, although the concentration of free chlorine can be raised to some extent if the amount of the electrolyte to add is increased, generation underwater salinity is made increased increasingly and the above-mentioned problem of **** (3) arises. although there is nothing with generation underwater salinity low originally that it was alike and was exceeded, in the conventional generation method, it is 1200 ppm in 600 thru/or salinity.

[0008] Furthermore, the above-mentioned problem of (4) is that the components for magnesium, such as calcium, etc. contained in water by electrolysis adhere to a negative plate as a scale, and the electric resistance of an electrode increases by adhesion of a scale, a diaphragm carries out blinding, or it serves as a serious trouble of the flow of water being checked. Complicated means -- the cure against a scale changes the polarity of cathode and an anode plate in the middle of electrolysis, or dissolves it with an acidic solution -- were taken conventionally.

[0009]

[Problem(s) to be Solved by the Invention] By having been made in view of the above-mentioned situation, and devising the water flow approach of water, the addition approach of an electrolyte water solution, and the load of a direct current in electrolyzing water and manufacturing acid electrolysis water and alkaline electrolysis water, this invention has little power consumption, is excellent in the generating effectiveness of free chlorine, and aims at offering the approach that adhesion of a scale in cathode can be prevented.

[0010]

[Means for Solving the Problem] The free-chlorine concentration which (2) acidity electrolysis water with much [effectiveness / (1) electrolysis effectiveness which is the conventional trouble is bad, and] power consumption contains as a result of advancing research so this invention person makes the above-mentioned purpose attain could not become high easily, and it predicted that it has a problem in the approach of electrolysis that all there is it, much the electrolyte, i.e., the salinity, which are contained in (3) acidity electrolysis water and the alkaline electrolysis water adjustment of concentration is not easy

water, etc. And although raw water is let flow and electrolyzed into the whole-quantity cell by the conventional approach in order that the acid electrolysis water which pH shows the range of 2.0 to 3.5, and pH may obtain the alkaline electrolysis water in which 10.5 to 12.0 is shown as a result of studying the solution approach That delivered and received the electrode and the electron in practice by this approach, and the electrolysis reaction has contributed It is bypassed and discharged only with the inner small kana water, without remaining most contributing to electrolysis, the electrolysis which introduces most electrolytes added into a cell with it there paying attention to being discharged without contributing to electrolysis similarly -- by restricting amount of water a little, making an electrolyte exist in this, and electrolyzing with a heavy load By that the above-mentioned problem is solvable and adoption of this means, the knowledge of the ability to also cancel the trouble of the adhesion of a scale to the cathode of (4) was carried out, and this invention was completed.

[0011] Namely, this invention is equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And the raw water supplied to an anode plate side is made to shunt toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, the raw water supplied to a cathode side is made to shunt toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make a cathode room let flow the water which carries out electrolysis processing, and water is electrolyzed using the water electrolyzer which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. It is the approach of manufacturing the acid electrolysis water of pH 2.0-3.0, and the alkaline electrolysis water of pH 10.5-12.0. an electrolyte is existed in the water which carries out electrolysis processing -- making -- an anode plate and a negative plate -- electrolysis processing -- it is the electrolysis water manufacturing method characterized by carrying out the load of the direct current 1500C [per 1l. of service water] or more.

[0012] In short, this invention differs from the conventional method which lets flow and electrolyzes the whole quantity of raw water into an anode plate room and a cathode room. Let some raw water flow in an anode plate room and a cathode room, and high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water are made to generate by making remarkably abundant conventionally the amount of direct current per electrolysis duty of water, and electrolyzing it. It is the approach of obtaining the acid electrolysis water (pH 2.0-3.0) and the alkaline electrolysis water (pH 10.5-12.0) of the concentration which is mixed with raw water, dilutes this high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water after that, and is made into the purpose.

[0013]

[Embodiment of the Invention] this invention approach is the electrolyzer equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And the raw water supplied to an anode plate side is made to shunt toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt toward the water which carries out electrolysis processing of the raw water supplied to a cathode side, and the water which does not carry out electrolysis processing, a cathode room is made to let flow the water which carries out electrolysis processing, and the water discharged from the cathode room is performed using the water electrolyzer made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Drawing 1 - drawing 4 are what illustrated the water electrolyzer of this structure, and are a sectional view, respectively.

[0014] Drawing 1 is the sectional view of the water electrolyzer equipped with the cell which prepared

the anode plate room, the middle room, and the cathode room by dividing with the diaphragm of two sheets. It is the example which carries out claim 2 invention. (A), (B), and (C) are the walls of a cell, respectively. This cell is divided into the anode plate room (D), the middle room (F), and the cathode room (E) by a diaphragm (1) and (2). (3) And (4) is an electrode plate, an electrode plate (3) is an anode plate and an electrode plate (4) is cathode. Many holes have opened to each electrode plate. Even if separated from the electrode plate (3), a diaphragm (1) and an electrode plate (4), and the diaphragm (2), you may stick, but when showing and sticking the case where it has stuck, as for drawing 1 , it is desirable to insert the charge of a nonconductive material of the shape of a sheet in which the same hole opened with each electrode plate between each electrode plate and each diaphragm. the raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing (the water which carries out electrolysis processing hereafter -- electrolysis -- it may be called service water). The water (6) which carries out electrolysis processing lets an anode plate room (D) flow, joins the water (7) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into acid electrolysis water (8) of predetermined pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. The water (10) which carries out electrolysis processing lets a cathode room (E) flow, joins the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into alkaline electrolysis water (12) of predetermined pH 10.5-12.0.

[0015] (6') And (10') (11') it is a bulb for adjusting amount of water, respectively (7'). A middle room (F) is filled up with a high-concentration electrolyte water solution. Usually, 10% or more of water solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte water-solution tank formed independently using a pump etc. Electrolytic concentration may be high how much, unless the fluidity of a water solution is barred. moreover, the electrolysis in the case of this example -- although the water flow approach of of service water (6) and (10) may be introduced from the lower inlet port of an anode plate room and a cathode room and may take out the generation water and gas after electrolysis from an up outlet, from the hole for upside outlets, it may be made to permute by the generation water after electrolysis, and gas, and may be introduced. the electrolysis in this case of making it permute and making it introduce -- the amount of water flow of service water is a value near the volume of the gas which occurs in an anode plate and cathode, and serves as the minimum value calculated by (a) and the (b) type which are mentioned later.

[0016] the electrolysis which lets water flow in the anode plate room (D) and cathode room (E) for electrolysis -- the electrolysis duty of water of service water (6) and (10) is an amount shown by (a) and the (b) type which are mentioned later, in the case of the current load of 1A (ampere), the peak is a part for 40ml/, and the value turns into a value counted backward from l. in 1500C /. If it electrolyzes the above condition, in an anode plate side, anions, such as a chlorine ion contained in the electrolyte water solution with which it was filled up in the middle room (F), will move by electrophoresis into an anode plate room (D) based on the transference number of each ion, an anion and water will be electrolyzed in an electrode surface, and gas, such as 1.9 or less strong acid nature electrolysis water and oxygen, and chlorine, will generate [a pH value]. This strong acid nature electrolysis water is discharged from an anode plate room (D), the water (7) by which electrolysis processing is not carried out is joined, and the acid electrolysis water (8) which has the target pH value (pH 2.0-3.0) is generated. On the other hand, in a cathode side, cations, such as sodium ion contained in the electrolyte water solution with which it was filled up in the middle room (F), move to the cathode interior of a room based on the transference number of each ion, a cation and water are electrolyzed in an electrode surface, and gas, such as 12.1 or more strong-base nature electrolysis water and hydrogen, generates [a pH value]. This strong-base nature electrolysis water is discharged from a cathode room (E), the water (11) by which electrolysis processing is not carried out is joined, and the alkaline electrolysis water (12) which has the target pH value (pH 10.5-12.0) is generated.

[0017] In this invention, the load of the direct current 1500C [/l.] or more is carried out to the

electrolysis duty of water. If this load is counted backward, the maximum of the electrolysis duty of water in the case of the current value of 1A will become 40ml. The reason for carrying out the load of the direct current 1500C [/l.] or more is from that it was the value of 1500C/l. or more, that the phenomenon in which the generation effectiveness of free chlorine increased by l. in 1500C /or more was shown, and adhesion of a scale [in / in 1500C /or more / cathode] not having been seen by l., as a result of investigating a current burden required to prevent the infusion solution phenomenon of the water which is one of the causes to which electrolysis effectiveness is reduced. And as mentioned above, the pH value of the strong acid nature electrolysis water generated by that of the anode plate interior of a room at the time of a 1500C [/l.] or more current load becomes 1.9 or less, and 12.1 or more are the pH value of the strong-base nature electrolysis water of the cathode interior of a room.

[0018] And the minimum value of this electrolysis duty of water is the amount which is sufficient for permuting the gas generated in an anode plate and cathode at the time of electrolysis, i.e., the amount approximated to the amount of gas generation calculable [with Faraday's law]. Incidentally it is the current of 1A (ampere) calculated by Faraday's law, and the yield of the gas in the anode plate in reference condition is a part for 3.49ml/, and the yield of the gas in cathode is a part for 6.98ml/. If the above conditions are summarized as a simple formula, the range the minimum [of the electrolysis duty of water] - greatest will become the formula of the following (a) and (b).

Anode plate side electrolysis duty-of-water (part for milliliter/) =3.5xA-40xA ... (a)

Cathode side electrolysis duty-of-water (part for milliliter/) =7.0xA-40xA ... (b)

(However, A is the amount of electrolysis currents)

The strong acid nature electrolysis water and strong-base nature electrolysis water which were described above by carrying out water electrolysis processing within the limits of this can be made to generate. And the acid target electrolysis water and the alkaline electrolysis water of a pH value can be obtained by mixing this generated strong acid nature electrolysis water and strong-base nature electrolysis water with the water by which electrolysis processing is not carried out.

[0019] next, electrolysis -- pH value control can be performed easily, the free chlorine concentration contained in acid electrolysis underwater is raised, and by mixing with the water which carries out the load of the direct current 1500C [/l.] or more to service water, and does not carry out electrolysis processing after that, and diluting explains why power efficiency is improvable. first, a mixing ratio with the water in which the reason which a pH value can adjust easily does not carry out electrolysis processing -- it is because a change of a rate can be made freely, without changing electrolysis conditions. That is, specifically, the acid desired electrolysis water and the alkaline electrolysis water of a pH value can be easily obtained by adjusting a bulb (10') and (11') by the cathode side again by adjusting a bulb (6') and (7') about an anode plate side in drawing 1 .

[0020] Next, why the free chlorine concentration contained in acid electrolysis underwater is raised is explained. The anode plate side electrolysis duty of water in this invention is an amount (a part for milliliter/) which multiplied the current (ampere) by 40 at the maximum. If this counts backward, the current which carries out a load to the water per l./m will be 25A or more, and the current burden of electrolysis will be a very high value compared with the conventional conditions. Consequently, the chlorine ion concentration of the anode plate interior of a room serves as a high value compared with the conventional approach.

[0021] It is as follows when the typical electrode reaction type which happens on an anode plate front face is shown here.

2H2O-4e~-> O2+4H+ ..... (c)

2Cl(s)~-2e~-> Cl2 ..... (d)

If the reaction of (c) is decomposed and considered here, water will dissociate to a hydrogen ion and a hydroxide ion first, and it will be thought that it passes through the process in which an electron is taken by electrode reaction and a hydroxide ion turns into oxygen gas and a hydrogen ion.

4H2O <=> 4H++4OH~ ..... (e)

4OH~-4e~-> O2+2H2O ..... (f)

Therefore, the reaction of (c) and (d) competes in an electrode surface, and the concentration of OH~ion

which exists near the electrode surface as a factor, and Cl~ion which governs a reaction rate involves greatly. So, when the chlorine ion concentration of the anode plate interior of a room is high like this invention, chlorine gas can be generated by the ratio higher than the conventional approach.
[0022] Moreover, the chlorine gas which occurred reacts with water further, and generates a strong hypochlorous acid, a strong hypochlorite, etc. of sterilizing properties.
Cl2+H2O <=> HCl+HClO .... (g)
HClO <=> H++ClO~ ..... (h)
the approach of this invention not only being easily raised in free chlorine concentration but electrolysis -- free chlorine concentration can be easily adjusted by changing a ratio with the water (7) in which the amount of service water (6) does not carry out modification and electrolysis processing. namely, electrolysis -- the time of making the amount of service water (6) into the minimum value of the (a) type -- free chlorine concentration -- most -- high -- becoming -- electrolysis -- the amount of service water (6) is increased -- it is alike, and it can follow and free chlorine concentration can be made low. Moreover, in case the acid electrolysis water of high free chlorine concentration is manufactured, the electrode material for anode plates may use an expensive platiniridium, palladium, etc. which are generally used, but if it is the conditions which raise the free chlorine concentration of this invention, free chlorine concentration also with the expensive electrode material which carried out platinum plating can be obtained to titanium.
[0023] Next, why power efficiency is improvable is explained. like the above-mentioned -- this invention -- the electrolysis duty of water -- receiving -- a current burden -- high -- an anode plate room and a cathode room -- setting -- electrolysis -- service water -- since inner ion concentration and electric electric conductivity are high, the electrical potential difference at the time of electrolysis can be lowered, consequently power consumption can be made low. Moreover, since underwater ion concentration increases, the infusion solution phenomenon which a water molecule moves toward cathode from an anode plate can be suppressed.
[0024] Next, the reason for the ability to decrease the attachment phenomenon of a scale to cathode is explained. The main electrolysis reactions performed in cathode are as follows.
2H2O+2e~-> H2+2OH~ ..... (i)
Na++e~-> Na ..... (j)
2Na+2H2O -> 2Na++2OH~+H2 .. (k)
Like the above-mentioned reaction formula, metal ions, such as sodium, are returned with generating of a hydroxide ion and hydrogen gas, it once becomes a metal, and water and the phenomenon of reacting happen further in cathode. If ion, such as calcium, magnesium, and a silica, exists underwater at this time, in order that those ion is also returned at the same reaction, it may be metalized or components, such as calcium and magnesium, may generate a hydroxide, these often carry out deposition to an electrode surface as a scale.
[0025] Thus, the phenomenon in which a scale adheres to cathode from the former in the case of the electrolysis of water is considered as an unescapable thing, the hardness component contained in raw water, using a water softener etc. as adhesion preventive measures is removed, or the becoming measures from which the scale adhering to an electrode is washed from an acid and which it becomes [measures], reverse the polarity of an electrode and make a scale exfoliate are taken. the electrolysis which lets water flow in the cathode room in the case of generating alkaline electrolysis water by electrolysis by the conventional approach -- although the amount of currents which carries out a load to service water so much is about (720C/(l.)) 12A per l./m about, often depositing on the surface of a negative plate in the case of this condition, and becoming a scale is observed. Visual observation of the electrode surface of electrolysis is carried out using the cell which made the side attachment wall of a cathode room with the ingredient of transparence using the electrode given in a JP,8-276184,A official report mentioned later. As a result of studying the conditions which do not deposit a scale in cathode, the amount of water flow is received. 1500C/l. or more When the load of the current 1800C [/l.] or more was carried out preferably and pH of a cathode room was made into 12.1 or more strong-base nature, it checked that a scale did not deposit in an electrode surface. It is surmised that this reason is

because many scale components are dissolved or it is hard to deposit a crystal under strong-base conditions. Furthermore, compared with the diaphragm by the side of an anode plate, the direction of the ion permeability of the diaphragm by the side of cathode chooses a large thing, and maintaining the pH value of the water solution of the middle interior of a room at acidity also has the effectiveness which prevents generating of a scale.

[0026] Drawing 2 is the sectional view of the cell which transformed drawing 1 . Although the cell of drawing 1 is a cell made to stick each electrode plate (3) and (4) to each diaphragm (1) and (2) using the electrode plate with which many holes opened as the electrode plate (3) of an anode plate, and an electrode plate (4) of cathode The usual electrode plate with which the hole has not opened as the electrode plate (3) of an anode plate as shown in drawing 2 , and an electrode plate (4) of cathode is used. Water is electrolyzed using the cell which has arranged each electrode plate (3) and (4) in the location distant from each diaphragm (1) and (2), electrolysis water manufacture can also be carried out and the same operation effectiveness can be obtained also in this case.

[0027] Claim 3 invention is explained. Claim 3 invention is an approach for carrying out claim 2 invention more effectively. That is, when making an anode plate room and a cathode room let water flow according to claim 2 invention and electrolyzing water, the amount of water flow to an anode plate room and a cathode room is little. electrolysis of this small amount -- if the load of the direct current 1500C [/l.] or more is carried out and it is electrolyzed to service water (6) and (10), the Joule's heat which generates an electrode and underwater in case the electrical and electric equipment flows cannot fully emit, but the problem on which the temperature of a cell rises will arise. Claim 3 invention solves the above-mentioned problem by using for cooling of a cell the water (7) which does not carry out electrolysis processing, and (11).

[0028] Drawing 3 is the sectional view showing in a cell the example which carries out claim 3 invention which transformed claim 2 invention using the water electrolyzer in which the anode plate room, the middle room, and the cathode room were established with the above-mentioned meaning. (A), (B), and (C) are the walls of a cell, respectively. this cell -- a diaphragm (1), (2) and a dashboard (13), and (14) -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- it is divided into the way (H). (3) is an anode plate and (4) is a negative plate. Although you may stick even if separated from the electrode plate (3), a diaphragm (1) and an electrode plate (4), and the diaphragm (2), what stuck to the diaphragm the electrode of a gestalt with which it has many holes and the laminating of the non-conductive sheet was carried out to the diaphragm side is desirable. a stream -- a way (G) is surrounded with the side attachment wall (A) and dashboard (13) of a cell -- having -- **** -- a stream -- the way (H) is surrounded with the side attachment wall (B) and dashboard (14) of a cell. The materials of a dashboard (13) and (14) are a metal, synthetic resin, etc.

[0029] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow. And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixing with the water (7) which does not carry out electrolysis processing, and turns into acid electrolysis water (8) of predetermined pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow. And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixing with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into alkaline electrolysis water (12) of predetermined pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell. They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively. A middle room (F) is filled up with a high-concentration

electrolyte water solution. Usually, 10% or more of water solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte water-solution tank formed independently using a pump etc.

[0030] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 3 , and a stream -- mixing with the water which let a way (G) and (H) flow Although unification mixing may be carried out in the place which came out of the cell as shown in drawing 3 , a hole may be prepared near the up outlet of a dashboard (13) and (14), and you may mix through this hole, respectively. the water (6) which carries out electrolysis processing and (10) -- the introductory approach to each anode plate room (D) and a cathode room (E) -- those with three kind -- [moreover,] As shown in drawing 3 , may introduce directly from the inlet port established in each lower part of an anode plate room (D) and a cathode room (E), and A hole is prepared in a dashboard (13) and the lower part of (14). First each of raw water (5) and (9) Passage (G), It may introduce into (H) and you may introduce into an anode plate room (D) and a cathode room (E) through a hole, respectively, and a hole may be prepared in a dashboard (13) and the upper part of (14), it may be made to permute by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it permute and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) type. the same certain ** as the case where actuation which electrolyzes water using the electrolyzer shown in drawing 3 is performed using the electrolyzer shown in drawing 1 and drawing 2 Moreover, the same is said of the operation in that case. moreover, this stream -- a way -- preparing -- a stream -- the method which cools a cell using the water which lets a way flow is applicable also to the water electrolysis approach using the electrolyzer shown in drawing 1 .

[0031] Claim 4 invention is explained. deformation of claim 2 invention which shows claim 4 invention to drawing 2 -- it is -- a stream -- it is the approach of performing the dashboard for forming a way using the water electrolyzer as which it was made serving with an electrode plate. Drawing 4 is the sectional view showing an example of the water electrolyzer. (A), (B), and (C) are the walls of a cell, respectively. this cell is divided one by one with an anode plate (3), and a diaphragm (1), a diaphragm (2) and a negative plate (4) -- having -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- the way (H) is formed. That is, an anode plate room (D) is formed by the anode plate (3) and the diaphragm (1), and the cathode room (E) is formed by the negative plate (4) and the diaphragm (2). moreover, a stream -- a way (G) is surrounded with the side attachment wall (A) and anode plate (3) of a cell -- having -- **** -- a stream -- the way (H) is surrounded with the side attachment wall (B) and negative plate (4) of a cell.

[0032] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow. And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixing with the water (7) which does not carry out electrolysis processing, and turns into acid electrolysis water (8) of predetermined pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow. And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixing with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into alkaline electrolysis water (12) of predetermined pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell. They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively.

[0033] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 4 , and a stream -- mixing with the water which let a way (G) or (H) flow Although unification mixing may be carried out in the place which came out of the cell as shown in drawing 4 , a hole may be prepared near the up outlet of an anode plate (3) and a negative plate (4), and you may mix through this hole, respectively. The introductory approach to each anode plate room (D) or cathode room (E) of the water (6) which carries out electrolysis processing, and (10) Moreover, those with three kind, As shown in drawing 4 , may introduce directly from the inlet port established in each lower part of an anode plate room (D) and a cathode room (E), and the lower part of an anode plate (3) and a negative plate (4) -- a hole -- preparing -- each of raw water (5) and (9) -- first -- a stream -- a way (G) -- It may introduce into (H) and you may introduce into an anode plate room (D) or a cathode room (E) through this hole, respectively, and a hole may be prepared in the upper part of an anode plate (3) and a negative plate (4), it may be made to permute by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it permute and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) type. the same certain ** as the case where actuation which electrolyzes water using the electrolyzer shown in drawing 4 is performed using the electrolyzer shown in drawing 1 - drawing 3 Moreover, the same is said of the operation in that case.

[0034] In the example shown in above-mentioned drawing 3 and above-mentioned drawing 4 , you may use it for one side of cathode and an anode plate independently, respectively, and may use it combining invention of claims 2 and 3. For example, it is attaching the equipment of invention of claim 2 and attaching the equipment of invention of claim 3 in an anode plate side at a cathode side etc. Moreover, although it has the cell which prepared the middle room (F) divided with the diaphragm of two sheets between the anode plate room (D) and the cathode room (E) in the electrolyzer of drawing 1 - drawing 4 , this invention can be carried out even if it uses the electrolyzer equipped with the cell which does not prepare one middle room using a diaphragm (1), as shown in drawing 5 and drawing 6 . And when using this equipment, an electrolyte water solution (15) and (16) are mixed in the water (6) which lets water flow in an anode plate room (D) and a cathode room (E) and which carries out electrolysis processing, and (10). Except the actuation which adds this electrolyte water solution, it is the same as the case where the electrolyzer of drawing 1 - drawing 4 is used.

[0035] The electrode and diaphragm in the electrolyzer used by this invention are explained. Even if it makes it stick with a diaphragm, it is not necessary to stick an electrode plate. When using it, sticking an electrode and a diaphragm, it is desirable to use for an electrode plate the plate which has many holes, and a reticulated thing. Even if it has a hole in using it, opening spacing without sticking an electrode and a diaphragm namely, it is not necessary to have. The ingredient of an electrode plate is the plate of copper, lead, nickel, chromium, titanium, a tantalum, gold, platinum, ferrous oxide, stainless steel, a carbon fiber, or graphite, and what plated the metal of a platinum group to titanium as an ingredient of an anode plate, or was carried out by the ability being burned is desirable. Moreover, as an ingredient of a negative plate, high chromium stainless steel (SUS316L) and nickel may be used.

[0036] moreover, in using it, sticking with a diaphragm the electrode plate which has many above-mentioned holes The sheet-like non-conductive ingredient which has the hole of a large number which are mostly in agreement with the hole of an electrode plate between each electrode plate and a diaphragm, For example, fluorine system resin (brand-name Teflon), ABS plastics, acrylic resin, An epoxy resin, polyurethane resin, polyethylene resin, polypropylene resin, Nylon, polyethylene terephthalate resin, polyamide resin, The electrode plate which arranges and carried out the laminating of the sheets, such as elastomers, such as synthetic resin, such as vinylchloride resin, natural rubber, SBR, a chloroprene, and polybutadiene, or the electrode plate with which the electric insulation coat was made to form in a diaphragm side, and many holes opened is used. This electrode plate itself is indicated by JP,8-276184,A. Since this electrode plate can decrease the phenomenon which the ion generated with

the electrode surface moves to a counter electrode, and the phenomenon which gas stagnates and checks a current between an electrode and a diaphragm, it is desirable in order not to make it electrolyze with the electrode surface of the side which touches a diaphragm. Drawing 1 , drawing 3 , and drawing 5 are the examples which used the electrode plate with which many holes of the above-mentioned structure opened. Moreover, in drawing 4 , in order that an electrode plate may make a dashboard serve a double purpose, the electrode plate with which many holes are not opened is used.

[0037] Moreover, as a diaphragm, they are textile fabrics and nonwoven fabrics, such as polyvinyl fluoride system fiber, asbestos, glass wool, polyvinyl chloride fiber, polyvinylidene chloride fiber, polyester fiber, and an aroma group polyamide fiber, as what has water flow nature, for example. Moreover, it is the diaphragm which used textile fabrics and the nonwoven fabric of polyester fiber, nylon fiber, and a polyethylene fiber for the aggregate, for example, and mixed titanium oxide to film material at chlorinated polyethylene, a polyvinyl chloride, polyvinylidene fluoride, or these. Moreover, semipermeable membrane, such as cellophane, or cation exchange membrane, anion exchange membrane, etc. are used as a diaphragm with little water flow nature. the electrolysis conditions of this invention -- electrolysis of a small amount -- since the current of a heavy load is passed, very strong acidity and alkaline water are made to generate or high-concentration chlorine gas makes service water generate, it is desirable to choose the diaphragm of the ingredient which can bear the condition.

[0038]

[Example] The example using the water electrolyzer shown in example 1 drawing 3 is explained. The dimension of a cell was 6cm in 15cm long, 9cm wide, and thickness, used platinum / oxidization iridium baking electrode for the having-hole of a large number whose effective areas are 2 50cm as electrode plate for anode plates (3) titanium plate, and used the electrode which carried out platinum plating for the having-to electrode plate for cathode (4)-hole of a large number whose effective areas are 2 50cm titanium plate. The laminating of the fluororesin (Teflon) sheet which is the non-conductive ingredient which has many holes was carried out, and it was used for the diaphragm side of each electrode plate. MF film made of a nonwoven fabric was used for the diaphragm (1) of the batch of an anode plate room and a middle room, the cation-exchange-resin film was used for the diaphragm (2) of the batch of a cathode room and a middle room, and the middle room (F) was filled up with the sodium chloride water solution of about 30% of concentration as an electrolyte. the dashboard (13) by which the anode plate side of a cell was prepared between the side attachment wall (A) and the anode plate (3) -- an anode plate room (D) and a stream -- it divides into a way (G) -- having -- **** -- electrolysis -- the purpose for which an anode plate room (D) lets service water (6) flow, and the water (7) by which electrolysis processing is not carried out cools a cell -- a stream -- a way (G) lets water flow. It joins again, and is mixed in the place which came out of the cell, and both water is discharged from an outlet (8). moreover, the dashboard (14) by which the cathode room side was prepared between the side attachment wall (B) and the negative plate (4) -- a cathode room (E) and a stream -- it divides into a way (H) -- having -- **** -- electrolysis -- the purpose for which a cathode room lets service water (10) flow, in addition service water (11) cools a cell -- a stream -- a way (H) lets water flow, and it joins again, mixes, and is discharged from an outlet (12).

[0039] The direct current which carries out a load to an electrode plate is 9.0A, and the electrical potential difference was made into 6 or 7 volts. the electrolysis duty of water (6) which lets water flow in an anode plate room -- a part for 0.1l./-- setting up -- moreover, a stream -- the amount of water of the water (7) which lets water flow on a way (G) was set as a part for 1.25l./, unification mixing was carried out in the neighborhood which came out of the cell, and the acid electrolysis water for 1.35l./was obtained. The pH value of the obtained acid electrolysis water was 2.68, the ORP value was 1130mV, and the measured value of the free chlorine to contain was 90 ppm. the electrolysis duty of water (10) which lets water flow in a cathode room on the other hand -- a part for 0.1l./-- setting up -- a stream -- the amount of water of the water (11) which lets water flow on a way (H) was set as a part for 0.9l./, unification mixing was carried out in the neighborhood which came out of the cell, and alkaline water was obtained. The pH value of the obtained alkaline electrolysis water was 11.54. The current burden of this example electrolysis service water (6) Hits, and is equivalent to 9.0A (5400C/(l.)). Although

continuously experimented on these conditions for 48 hours, no adhesion of a scale to cathode was generated. Moreover, the infusion solution phenomenon which water moves to cathode from an anode plate was not seen at all. next, the amount of water which lets an anode plate room flow where the pH value of the acid electrolysis water to generate is kept constant and a stream -- it changed and experimented in various amount of water which lets a way (G) flow, change of ORP and a free chlorine content was measured, and the infusion solution phenomenon was observed. The result is shown in Table 1. It turned out that an infusion solution phenomenon arises [reduction and the current burden of free chlorine concentration] in l. in 1350 and 338C /with the increment in the electrolysis duty of water of an anode plate, and the water level of a middle room goes up.

[0040]

[Table 1]

電圧 V	電流 A	電力消費量 W	電解用水量 L/分	酸性電解水量 L/分	pH	ORP mV	遊離塩素 ppm	電流負荷 クーロン/L	輸液現象
6.5	9.0	58.5	0.03	1.35	2.68	1143	125	23700	なし
6.7	9.0	60.3	0.1	1.35	2.68	1139	90	5400	なし
6.7	9.0	60.3	0.2	1.45	2.68	1138	90	2700	なし
6.8	9.0	61.2	0.3	1.50	2.68	1137	85	1800	なし
6.9	9.0	62.1	0.4	1.50	2.68	1136	75	1350	少しあり
7.0	9.0	63.0	1.6	1.60	2.68	1133	40	338	多くあり

[0041] the same [using the same electrolytic device as an example 1] except having used the electrode plate which replaced with a titanium plate and platinum / oxidization iridium baking electrode, and performed platinum plating to titanium as an electrode plate for example 2 anode plates (3) -- it was operated. When the generating effectiveness of the free chlorine at this time was investigated, the result of Table 2 was obtained. High-concentration chlorine generating can be checked from Table 2.

[0042]

[Table 2]

電圧 V	電流 A	電力消費量 W	電解用水量 L/分	酸性電解水量 L/分	pH	ORP mV	遊離塩素 ppm
5.8	8.9	51.6	0.03	1.5	2.86	1138	130
6.2	8.9	55.2	0.1	1.5	2.74	1141	110
6.4	8.9	57.0	0.2	1.5	2.72	1142	105

[0043]

[Effect of the Invention] the little electrolysis extracted from raw water in this invention, since an electrolyte is made to exist in service water, the load of the direct current 1500C [/l.] or more is carried out, and water electrolysis is carried out, and it mixes with raw water after that and considers as the electrolysis water of the target pH Generation ion concentration can be raised at the time of electrolysis, and the infusion solution phenomenon of water can be prevented, and the generation effectiveness of free chlorine can be heightened. That the free chlorine concentration which (2) acidity electrolysis water with much [effectiveness / (1) electrolysis effectiveness is bad and] power consumption contains cannot become high easily and adjustment of concentration [which is not easy] (3) Will cause salt damage, if it is mostly used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) The fault of the conventional water electrolysis of being easy to generate the trouble in which a scale adheres to cathode by electrolysis can be improved, and the acid electrolysis water of predetermined pHpH 2.0-3.0 and the alkaline electrolysis water of pH 10.5-12.0 can be manufactured efficiently. Moreover, since adhesion of a scale can be prevented, there is an advantage from which actuation of washing from reversal of the periodical pole of an electrode currently performed conventionally and an acid becomes

unnecessary, and the softener of the raw water which carries out electrolysis processing also becomes unnecessary. Moreover, in this invention, a middle room is prepared, and when the electrolyzer which filled up this middle room with the electrolyte is used, electrolytic supply becomes easy.

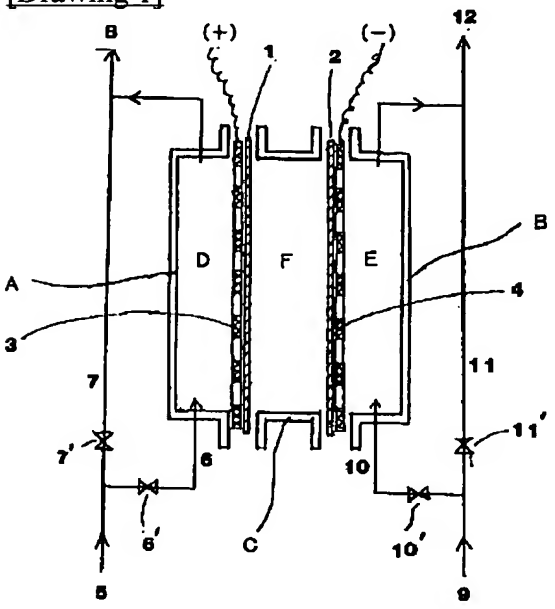
[Translation done.]

* NOTICES *

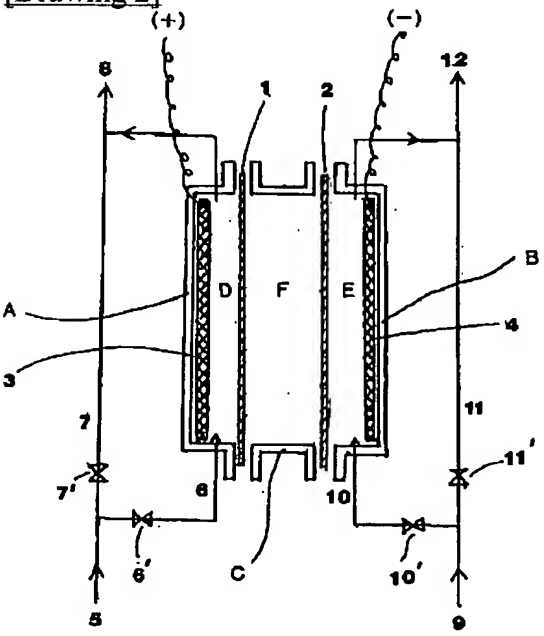
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

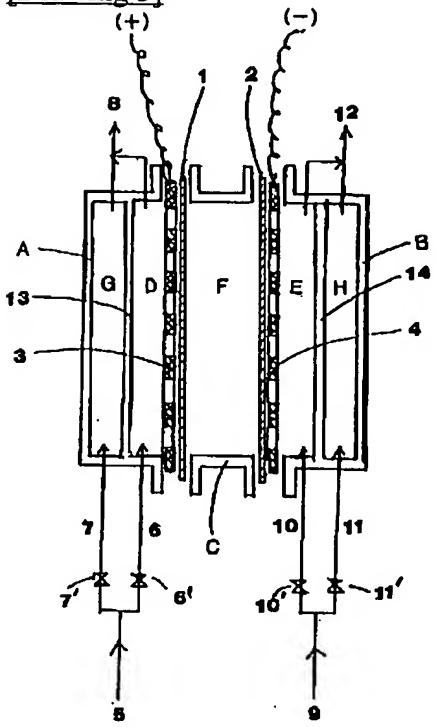
[Drawing 1]



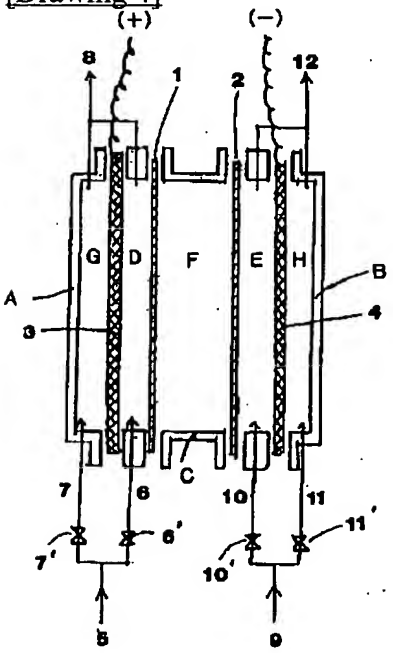
[Drawing 2]



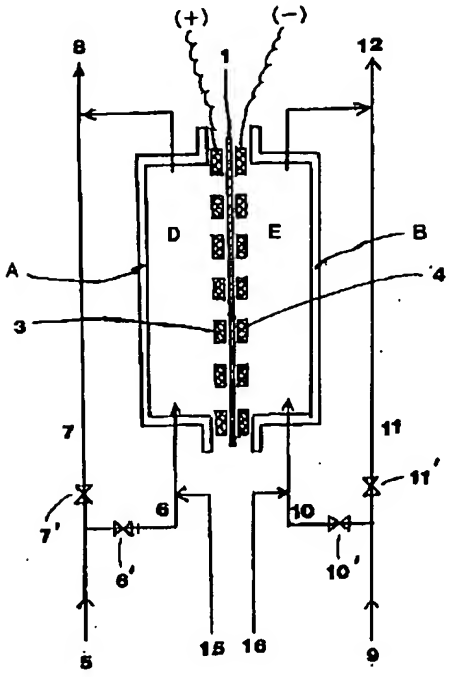
[Drawing 3]



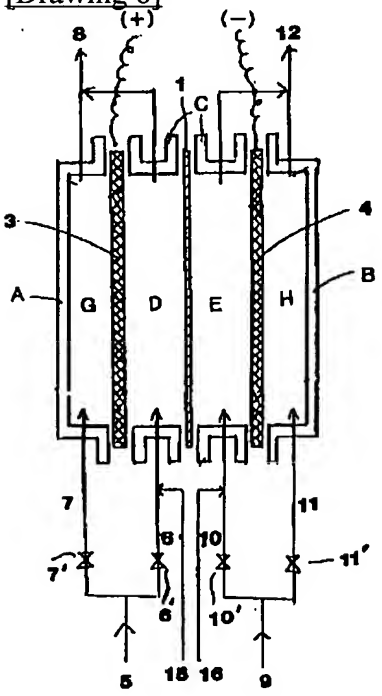
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]